

APPENDIX A
GROUND SYSTEM STRING TESTS

A. GROUND SYSTEM STRING TESTS

This appendix provides detailed information on all of the ground system string tests which will be conducted prior to the second servicing mission. This information includes objectives of each test, resource requirements (such as personnel, facilities, software, hardware, etc.), roles and responsibilities of each organization, and projected test schedules.

A.1 SMGT-21/SR #2 VERIFICATION

This Section provides the detail information on the SMGT-21 Test for SR-2 Verification.

A.1.1 Purpose

SMGT-21 is the first ground system string test to be conducted for verification of SM2 readiness. SMGT-21 is designed to verify the second phase of ground system development capabilities(SR-2).

A.1.2 Objectives

- a. To verify the Space Telescope Imaging Spectrograph (STIS) and Near Infrared Camera and Multi-Object Spectrometer (NICMOS) Phase 1 commanding capabilities, which includes ST ScI proposal processing and Science Mission Specification (SMS) generation, **Payload Operations /Control Center (POCC)** Applications Software Support (PASS) processing, and product review.

- b. To verify STIS and NICMOS engineering and science data flow and processing through the ground system including the **Preliminary Operations Requirements and Test Support (PORTS)** Refurbishment System (PRS), PASS, Astrometry and Engineering Data Processor (AEDP), Engineering Support System (ESS), Data Capture Facility (DCF), and the ST ScI.
- c. To verify STIS and NICMOS memory load and dump capabilities in PRS.
- d. To verify ORU/ORI switching capabilities in PRS and ESS using the new Servicing Mission database.
- e. To verify the ground system can function successfully in the GSFC simulation program configurations.
- f. To perform standard ground system regression test activities. These regression test activities will be detailed in the SMGT-21 Test Plan/Procedure.

A.1.3 Activities

SMGT-21 will consist of two distinct scenarios or test sessions. Two sessions were developed because of the distinctness of science scheduling and realtime telemetry processing. Each test session is created to ensure that all test objectives and requirements covered by this SMGT are verified.

The first session, Command Generation and Processing, will involve the Science Planning and Scheduling System (**SPSS**), PASS, and the Mission Elapsed Graphic Generator (MEGG). This test session will verify the ability of **SPSS** to produce several SMSs containing STIS and NICMOS Phase 1 commands.

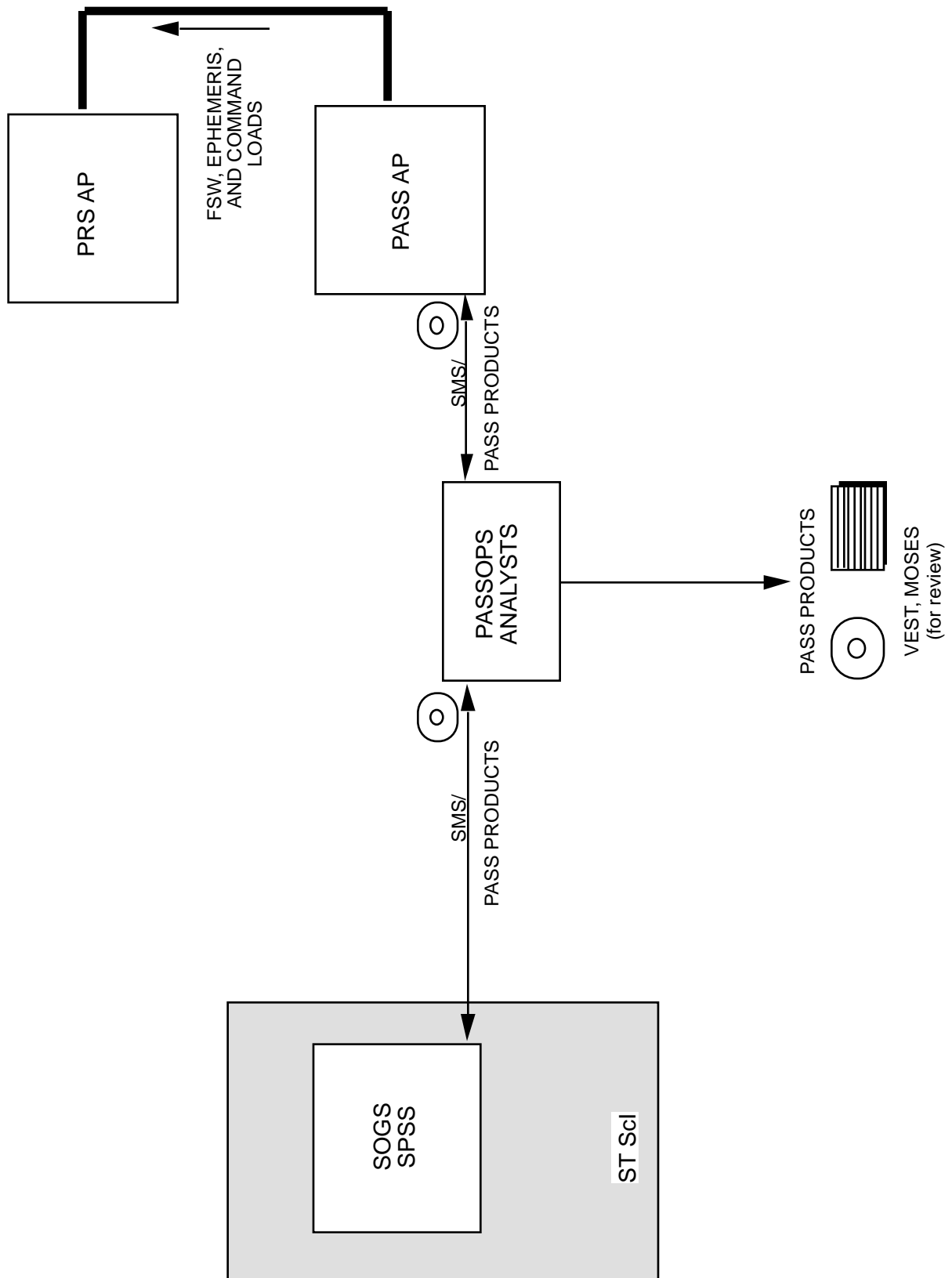


Figure A-1 SMGT 21 Session 1 Configuration

Once generated, the SMSs will be processed through PASS Mission Scheduler and Command Loader. Output files will be input into MEGG to generate a timeline with the new instrument information. Output products from all systems will be carefully reviewed to ensure that no errors exist in processing. Refer to Figure A-1 for an illustration of the basic system configuration.

The second session, Realtime Telemetry Flow, will utilize the HST Simulator, Simulation Operations Center (SOC), Shuttle/POCC Interface Facility (SPIF), PRS, PASS, ESS, AEDP, **Observation Support System (OSS)**, and DCF systems. This session will be used to validate the PRS STIS/NICMOS portion of the test and will involve transitioning between TDRSS and JSC modes, which is a necessary configuration during future SIMs, JISs, and the mission. Output products from all systems will be analyzed for erroneous conditions. Refer to Figures A-2 and A-3 for an illustration of the basic system configuration.

A.1.4 Roles and Responsibilities

This Section identifies the SMGT-21 support roles and responsibilities for SR-2 Verification. (See Table A-1).

A.1.5 System/Facility Requirements

This section identifies the interfaces and functionality required from each of the systems and/or facilities involved in SMGT-21.

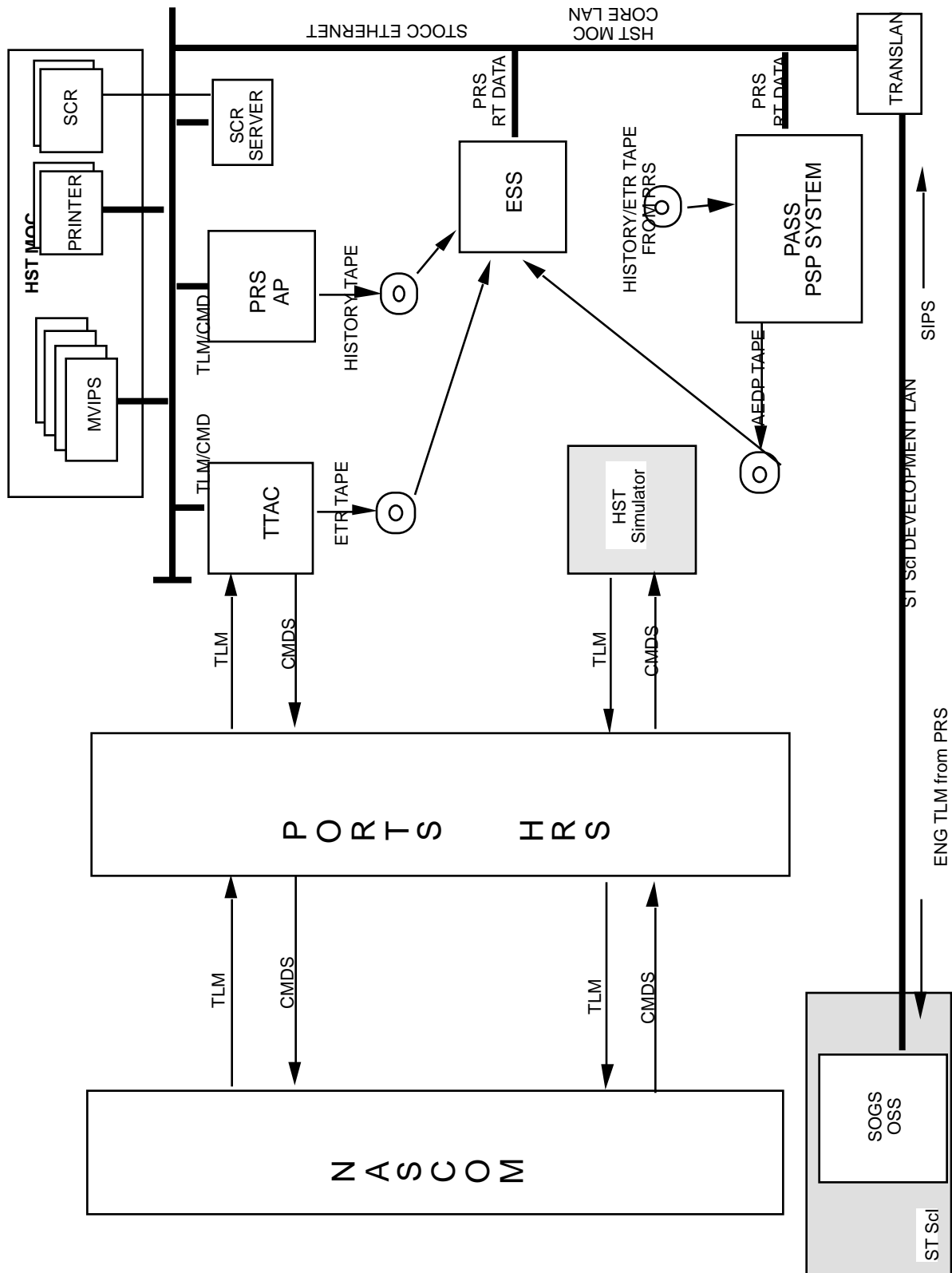


Figure A-2. SMGT Realtime Telemetry Flow (TDRS Mode)

A.1.5.1 PORTS Refurbishment System. The PRS system, Release 7.0, will be required to support test activities in Session 2. PRS will be configured to support command generation and telemetry receipt. PRS will be required to support the following interface connections for SMGT-21: NASA Communications (NASCOM) for connection to SOC and HST SIM, PASS, and ESS. PRS will interface with NASCOM for the receipt of engineering telemetry and the transfer of realtime commands and **On-Board Computer** (OBC) loads. PRS will interface with PASS for the transfer of engineering telemetry and the receipt of OBC loads. PRS will interface with ESS for the transfer of engineering telemetry.

Table A-1. SMGT 21

SUPPORT AREA	SYSTEM/RESOURCES	ORGANIZATION
STOCC	PRS PASS, AEDP ESS TMS/TALOS HST SIMULATOR PDB	LORAL/LMTO CSC/ATSC LORAL/LMTO/ATSC HUGHES/LMTO LMTO/ATSC GSFC CODE 441
DOC	AP/TTAC/COMM	ATSC
ST ScI	SPSS/PASS/PDOPS	ST ScI
SDPF	DCF	ATSC
MSOCC	SPIF	ATSC
SOC	SOC SIMULATOR	ATSC
ITAV	N/A	CTA
SVG	N/A	MOSES
O&GS SMSE	N/A	GSFC CODE 441
SYSTEMS ENGINEERING	N/A	MOSES
IDT	N/A	GSFC CODE 442

A.1.5.2 POCC Application Software Support. The PASS system, Release 26.04, will be required to support test activities during all test sessions. PASS will support the following interface connections for SMGT-21: **SPSS**, PRS, and AEDP. During Test Session 1, PASS will process the SMSs from the Institute and produce Mission Schedules and OBC loads. PASS

will then interface with PRS for the transfer of these OBC loads. During Test Session 2, PASS will interface with PRS for the receipt of engineering telemetry and AEDP for the transfer of telemetry subsets.

A.1.5.3 Astrometry and Engineering Data Processor. The AEDP system, Release 23, will be required to support test activities during Test Session 2. AEDP will support the following interface connections for SMGT-21: PASS, ESS, and **PODPS**. AEDP will inter-face with PASS for the receipt of telemetry captured during Test Session 2. AEDP will interface with ESS and **OSS/PODPS Unified System (OPUS)** for the transfer of AEDP magnetic tape products.

A.1.5.4 Engineering Support System. The ESS system, Release 3.8, will be required to support test activities during Test Session 2. ESS will support the following interface connections for SMGT-21: PRS and AEDP. ESS will interface with PRS for the receipt of realtime engineering telemetry and history tapes. ESS will interface with AEDP for the receipt of astrometry and engineering data tapes.

A.1.5.5 Telemetry Analysis and Logic for Operations Support. The most current release of the Telemetry Analysis and Logic for Operations Support (TALOS) system will be used to support test activities during Test Session 2. TALOS will support the following interface connections: SPIF and ESS. TALOS will interface with SPIF for the receipt of Payload Parameter Frame (PPF) and

Calibrated Ancillary System (CAS) data. TALOS will interface with ESS for the receipt of HST engineering telemetry in the form of Engineering Data Blocks (EDBs).

A.1.5.6 Thermal Monitoring System. The most current release of the Thermal Monitoring System (TMS) system will be required to support test activities during Test Session 2. TMS will be required to interface with the SPIF facility during SMGT-21. TMS will interface with SPIF for the receipt of PPF and CAS data.

A.1.5.7 Project Data Base. For the SM2, the PDB will be referred to as the Servicing Mission Data Base (SMDB), Release SMDB-21, which will be used during interface, regression testing, and all SMGT-21 test sessions. **Applicable** PDB files will be validated by MOSES SVG personnel and Instrument Development Teams (IDTs) prior to test execution.

A.1.5.8 Data Capture Facility. The DCF, Engineering Release 4.19a, located in the Science Data Processing Facility (SDPF) in Building 23, will be required to support test activities during Test Session 2. The DCF will support the following interface connections: NASCOM and the **PODPS**. The DCF will interface with NASCOM for the receipt of canned science telemetry from the HST Simulator. Once the science data has been processed, the DCF will interface with **PODPS** for the transfer of science data subsets.

A.1.5.9 Science Planning and Scheduling System. The **SPSS/OSS** is located at the ST ScI on the campus of the Johns

Hopkins University in Baltimore. The **SPSS/OSS** will be required to support the following interface connections for SMGT-21: PASS, AEDP, and DCF. The **SPSS** will interface with PASS for the transmission of a Science Mission Specification (SMS) and receipt of PASS products. The **OSS** will interface with PRS for the receipt of engineering data. The **PODPS** will interface with the DCF for the receipt of science data subsets. The ST ScI will support these interfaces: **SPSS,OSS** and **PODPS**.

A.1.5.10 Shuttle POCC Interface Facility. The SPIF, located within the Multi-Satellite Operations Control Center (MSOCC) in Building 14, will be required to support test activities during Test Session 2. The SPIF will be required to provide the following interface connections: SOC and ESS. The SPIF will interface with the SOC for the receipt and processing of JSC telemetry containing PPF and CAS data. The SPIF will interface with TMS and TALOS for the transfer of shuttle data.

A.1.5.11 HST Simulator. The HST Simulator will be required to support test activities during Test Session 2. During this test session, the simulator is expected to interface with the SOC and PRS. The HST Simulator will provide these interfaces for the transfer of simulated spacecraft engineering telemetry and the receipt of realtime commands. The HST Simulator will accept command data at both 125 and 1000 bits per second (bps) in the TDRSS block format and transmit 32 Kilobits per second (Kbps) format TN engineering telemetry also in the TDRSS block format. Telemetry from the simulator will be transmitted to the SOC, re-formatted into JSC blocks, and then transferred to the HST Mission Operations Center (MOC) for capture and processing.

Similarly, commands generated at the PRS system will be reformatted by the SOC into TDRSS format and sent to the HST Simulator. The HST Simulator will also transmit canned science data for the STIS and NICMOS instruments which will be captured by the DCF.

A.1.5.12 Simulations Operations Center. The SOC, located at the Network Test and Training Facility (NTTF) in Building 25, will be required to support activities during Test Session 2. The SOC will be required to interface with the HST Simulator and the HST MOC. The SOC will provide these interfaces for the receipt of simulated spacecraft engineering telemetry from the HST Simulator, receipt of JSC commands from the HST MOC and the transfer of re-formatted HST commands and JSC telemetry. The SOC will also receive JSC commands from the HST MOC which will be reformatted into TDRSS blocks and then routed to the HST Simulator. In addition, the SOC will be utilized to verify STIS and NICMOS memory loading and dumping capabilities on PRS.

A.1.6 Duration

Test Session 1: 40 hours

Test Session 2: 12 hours

A.1.7 Dependencies

Dependencies for this test include:

- STIS and NICMOS science data from **BASD**
- SOC simulation capabilities to perform memory load and dump
- All SR-2 SM upgrades to ground system have been completed

A.1.8 Schedule

These are the planned dates for SMGT-21 activities, based on the most recent version of the O&GS Project Schedule.

- | | |
|-------------------------------|---------|
| - Test Plan/Procedure (Draft) | 7/21/95 |
| - Test Plan/Procedure (Final) | 8/11/95 |
| - Session 1 | 8/3/95 |
| - Session 2 Dry Run | 8/8/95 |
| - Session 2 Test | 8/17/95 |
| - Session 2 Contingency | 8/24/95 |
| - Test Report | 9/15/95 |

A.2 SMGT-22 SR #3 VERIFICATION

This Section provides detail information on the SMGT-22 **Part 1 and Part 2 Testing** for SR-3 Verification.

A.2.1 SMGT-22 Part 1

This Section covers Part 1 of the SMGT-22 testing.

A.2.1.1 Purpose

SMGT-22 **Part 1** is a string test designed to verify the third phase of ground system readiness and support for the Second Servicing Mission.

A.2.1.2 Objectives

- a. **To exercise the STIS and NICMOS Phase 2 commanding capabilities including ST Sci proposal processing and SMS generation, PASS processing, and product review.**
- b. To perform standard regression test activities against the new releases of system software. These activities will be detailed in the test plan/procedure document for SMGT-22 **Part 1**.
- c. To verify the **NASA Standard Spacecraft Computer (NSSC-1)** interface with the new SIs for both commanding and telemetry.
- d. To verify the PASS processing, PRS command and telemetry for all **Solid State Recorder (SSR)** possible combinations (Position 1, Position 2, and Position 1 and 2) and modes for SM2. (Science data, science and engineering data, and safemode)

A.2.1.3 Activities

SMGT-22 **Part 1** will consist of two test sessions. Each test session is created to ensure that all test objectives and requirements covered by this SMGT are verified. A brief description of these two test sessions is covered in following paragraphs.

The first session, Command Generation and Processing, will involve SPSS, PASS, and MEGG. The ST ScI will also provide SMSs that will verify the capability of scheduling and commanding the SSR in all possible locations. Once generated, the SMSs will be processed through PASS Mission Scheduler and Command Loader. Output files will be input into MEGG to generate a timeline with the new instrument information. Output products from all systems will be carefully reviewed to ensure that no errors exist in processing. Refer to Figure A-4 for an illustration of the basic system configuration.

The second session, **Realtime Telemetry Flow**, will utilize the VEST, SOC, SPIF, PRS, PASS, ESS, AEDP, **OPUS** and the Packet Processor (PACOR II) systems. This session will be used to validate STIS/NICMOS science data reformatting capabilities and SSR dump processing. The VEST will be configured to accept commanding and transmit science and engineering telemetry for the new instruments as well as SSR dumps from recorded science and engineering data. Output products from all systems will be **analyzed for erroneous conditions**. **Refer to Figure A-4 for an illustration of the basic system configuration.**

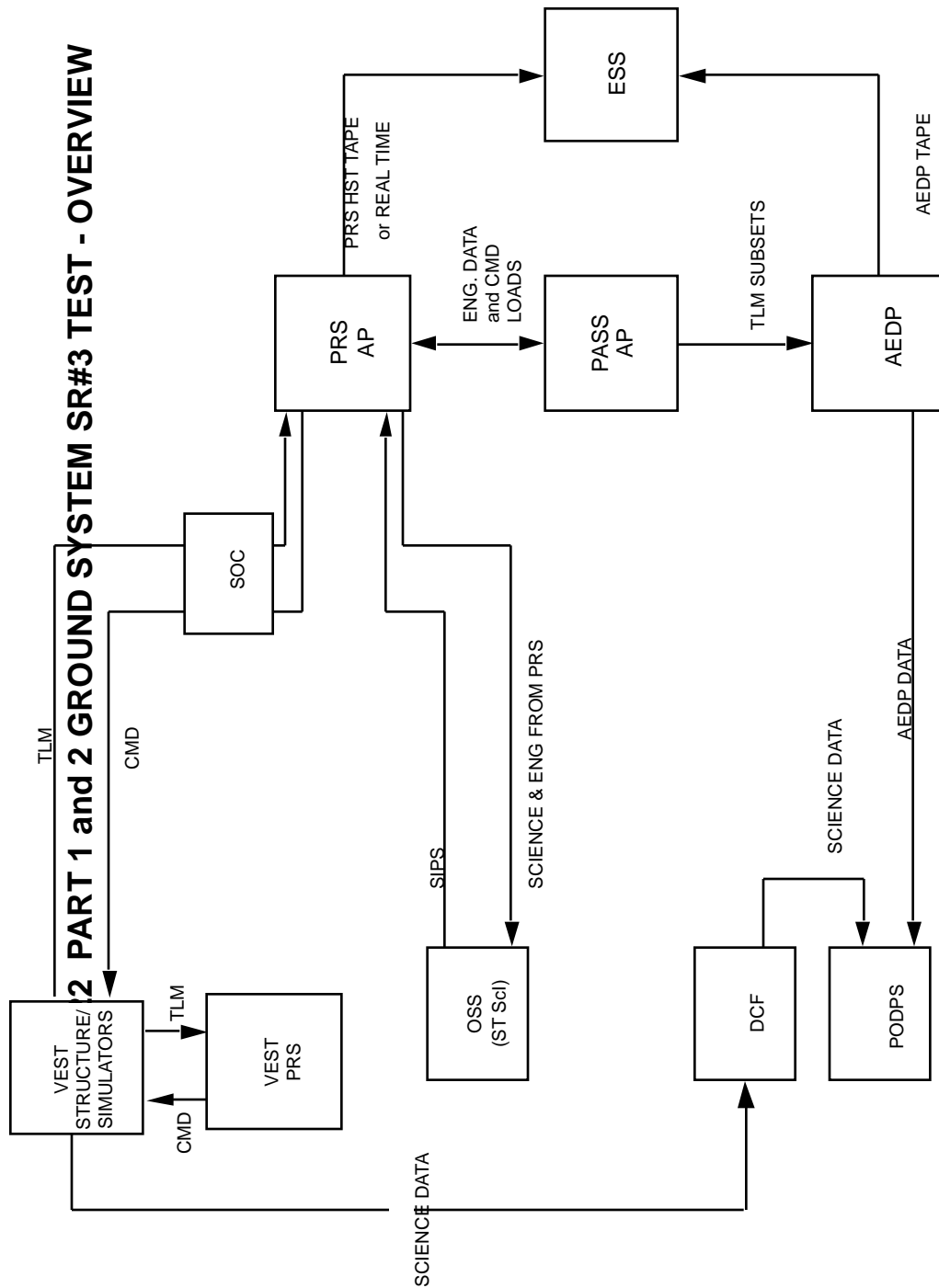


Figure A-4 SMGT-22 Overview

A.2.1.4 Roles and Responsibilities

This Section identifies the SMGT-22 **Part 1** support roles and responsibilities for SR-3 Verification. (See Table A-2)

A.2.1.5 System/Facility Requirements

This section identifies the interfaces and functionality required from each of the systems and/or facilities involved in SMGT-22.

A.2.1.5.1 PORTS Refurbishment System. The PRS system, Release 9.0, will be required to support test activities in Session 2. PRS will be configured to support command generation and telemetry receipt. PRS will be required to support the following interface connections for SMGT-22 **Part 1**: NASCOM (for connection to SOC and the VEST), PASS, and ESS. PRS will interface with NASCOM for the receipt of engineering telemetry and the transfer of realtime commands and OBC loads. PRS will interface with PASS for the transfer of engineering telemetry and the receipt of OBC loads. PRS will interface with ESS for the transfer of engineering telemetry and SSR engineering dumps.

A.2.1.5.2 POCC Application Software Support. The PASS system, Release 28, will be required to support test activities during all test sessions. PASS will support the following interface connections for SMGT-22 **Part 1**: **SPSS**, PRS, and AEDP. During Test Session 1, PASS will process the SMSs from the ST ScI and produce Mission Schedules and loads. PASS will then interface with PRS for the transfer of these OBC loads. During Test Session 2, PASS will interface with

PRS for the receipt of engineering telemetry and AEDP for the transfer of telemetry subsets.

Table A-2. SMGT-22

SUPPORT AREA	SYSTEM/RESOURCES	ORGANIZATION
STOCC	PRS PASS, AEDP ESS TMS/TALOS PDB	LORAL/LMTO CSC/ATSC LORAL/LMTO/ATSC HUGHES/LMTO GSFC CODE 441
DOC	AP/TTAC/COMM	ATSC
ST ScI	SPSS/PASS/OPUS/HDA	ST ScI
SDPF	PACOR II	ATSC
MSOCC	SPIF	ATSC
SOC	SOC SIMULATOR	ATSC
VEST	STIS AND NICMOS BRZ SIMULATOR/ETU	GSFC CODE 442
ITAV	N/A	CTA
SVG	N/A	MOSES
O&GS SMSE	N/A	GSFC CODE 441
SYSTEMS ENGINEERING	N/A	MOSES
IDT	N/A	GSFC CODE 442

A.2.1.5.3 Astrometry and Engineering Data Processor. The AEDP system, Release 24, will be required to support test activities during Test Session 2. AEDP will support the following interface connections for SMGT-22 Part 1: PASS, ESS, and **OPUS**. AEDP will interface with PASS for the receipt of telemetry captured during Test Session 2. AEDP will interface with ESS and **OPUS** for the transfer of AEDP magnetic tape products.

A.2.1.5.4 Engineering Support System. The ESS system, Release 3.8, will be required to support test activities during Test Session 2. ESS will support the following interface connections for SMGT-22 Part 1: PRS, AEDP, and **OPUS**. ESS will interface with PRS for the receipt of

realtime engineering telemetry, SSR engineering dumps and history tapes. ESS will interface with AEDP for the receipt of Astrometry and engineering data tapes.

A.2.1.5.5 Telemetry Analysis and Logic for Operations Support. The most current release of the TALOS system will be required to support test activities during Test Session 2. TALOS will support the following interface connections: SPIF and ESS. TALOS will interface with SPIF for the receipt of PPF and CAS data. TALOS will interface with ESS for the receipt of HST engineering telemetry in the form of EDBs.

A.2.1.5.6 Thermal Monitoring System. The most current release of the TMS system will be required to support test activities during Test Session 2. TMS will be required to interface with the SPIF facility during SMGT-22 Part 1. TMS will interface with SPIF for the receipt of PPF and CAS data.

A.2.1.5.7 Project Data Base. The PDB, Release SMDB22, will be used during interface, regression testing, and all SMGT-22 Part 1 test sessions. A portion of the PDB files will be validated by MOSES SVG personnel and IDTs prior to test execution.

A.2.1.5.8 Packet Processor II. The PACOR II, Release 3.0, will be required to support test activities during Test Session 2. PACOR II will support the following interface connections: NASCOM and **OPUS**. The PACOR II will interface with NASCOM for the receipt of science telemetry from the **STIS AND NICMOS BESST Release Zero (BRZ)** located in the VEST and SSR science dumps. Once the science data has been

processed, the PACOR II will interface with **OPUS** for the transfer of science data subsets.

A.2.1.5.9 Science Telescope Science Institute. The **ST ScI** will be required to support the following interface connections for SMGT-22 Part 1: PASS, AEDP, and PACOR II. The **SPSS** will interface with PASS for the transmission of a **Science Mission Specification (SMS)** and receipt of PASS products. The **OPUS** will interface with AEDP for the receipt of engineering data. The **OPUS** will interface with the PACOR II for the receipt of science data subsets. The ST ScI will support these interfaces: **SPSS** and **OPUS**.

A.2.1.5.10 Shuttle POCC Interface Facility. The SPIF will be required to support test activities during Test Session 2. The SPIF will be required to provide the following interface connections: **Space Support Equipment (SSE)/AFT Flight Deck (AFD) Sim** and ESS. The SPIF will interface with the SSE/AFD Sim for the receipt and processing of JSC telemetry containing PPF data. The SPIF simulator will emulate the CAS data set. The SPIF will interface with TMS and TALOS for the transfer of shuttle data.

A.2.1.5.11 HST Simulator. The HST Simulator will be required to support dry run test activities during Test Session 2. During the dry runs, the simulator is expected to interface with the SOC and PRS. The HST Simulator will provide these interfaces for the transfer of simulated spacecraft engineering telemetry and the receipt of realtime commands. The HST Simulator will accept command data at 1000 bps in the TDRSS block format and transmit 32 Kbps format TN/HN engineering telemetry also in the TDRSS block format.

Telemetry from the simulator will be transmitted to the SOC, reformatted into JSC blocks, and then transferred to the HST MOC for capture and processing. Similarly, commands generated at the PRS system will be reformatted by the SOC into TDRSS format and sent to the HST Simulator.

A.2.1.5.12 Simulation Operations Center. The SOC will be required to support activities during Test Session 2. The SOC will be required to interface with the HST Simulator and the HST MOC. The SOC will provide these interfaces for the receipt of simulated spacecraft engineering telemetry from the HST Simulator, receipt of JSC commands from the HST MOC and the transfer of reformatted HST commands and JSC telemetry. The SOC will also receive JSC commands from the HST MOC which will be reformatted into TDRSS blocks and then routed to the HST Simulator. The SOC will, if VEST is unavailable, transmit canned science data for the STIS and NICMOS instruments and SSR science dumps which will be captured by PACOR II. The SOC will also, if VEST is unavailable, provide SSR engineering dumps to PRS.

A.2.1.5.13 BESST Release Zero. The BESST Release Zero (BRZ), located at the VEST facility in Building 29, will be required to support activities during Test Session 2. The **STIS AND NICMOS BRZ** will be required to interface with the VEST structure (including DF224/**80386 Coprocessor (COP)** and NSSC-1 computers), and with NASCOM for connection with the HST MOC PRS system. The **STIS AND NICMOS BRZ** will provide these interfaces for the receipt of STIS and NICMOS command loads and transmission of memory dumps to the PRS system.

A.2.1.5.14 SSR Engineering Test Unit. The SSR Engineering Test Unit (ETU), located at the VEST facility in Building 29, will be required to support activities during Test Session 2. The **SRR** ETU will be required to interface with the VEST structure. The **SRR** ETU will provide, through the VEST systems and **NASCOM**, the transmission of science recorded dumps to PACOR II and engineering recorder dumps to the PRS system.

A.2.1.6 Duration

Test Session 1 - 40 hours

Test Session 2 - 10 hours

A.2.1.7 Dependencies

The dependencies for this test include:

- SMDB with updates for SSR, **Data Interface Unit (DIU)**, and **Rate Gyro Assembly (RGA)**
- All SR-3 SM upgrades to ground system have been completed
- VEST **STIS AND NICMOS BRZ**
- SOC upgrade for new SIs and SSR capabilities
- VEST **SRR** ETU

A.2.1.8 Test Schedules

These are the planned dates for SMGT-22 **Part 1** activities, based on the most recent version of the O&GS Project Schedule.

- | | |
|-------------------------------|---------|
| - Test Plan/Procedure (Draft) | 2/23/96 |
| - Test Plan/Procedure (Final) | 3/13/96 |
| - Session 1 | 3/1/96 |
| - Session 2 Dry Run | 3/7/96 |
| - Session 2 Test | 3/15/96 |
| - Session 2 Contingency | 3/22/96 |

- Test Report

4/12/96

A.2.2 SMGT-22 Part 2

This Section covers Part 2 of the SMGT-22 testing.

A.2.2.1 Purpose

SMGT-22 **Part 2** is a string test designed to verify the ground system readiness and support for the Second Servicing Mission **with the baseline release SM PDB (containing STIS and NICMOS inputs) and the release of NSSC-I flight software.**

A.2.2.2 Objectives

- a. To exercise the STIS and NICMOS Phase **3** commanding capabilities including ST ScI proposal processing and SMS generation, PASS processing, and product review.
- b. To verify STIS and NICMOS engineering telemetry and command capabilities with **baseline** database from the STIS/NICMOS IDTs.
- c. To verify the NSSC-1 interface with the new SIs for both commanding and telemetry.
- d. **To verify remaining SSR activities not completed in SMGT-22 Part 1.**
- e. **To verify remaining HST Simulator SM2 capabilities.**

A.2.2.3 Activities

SMGT-22 **Part 3** will consist of two test sessions. Each test session is created to ensure that all test objectives and requirements covered by this SMGT are verified. A brief description of these two test sessions is covered in following paragraphs.

The first session, Command Generation and Processing, will involve **SPSS**, PASS, and MEGG. This test session will verify the ability of **SPSS** to produce several SMSs containing STIS and NICMOS Phase 3 commands. SSR activities not completed from SMGT-22 **Part 1** will also be scheduled in the SMSs. Once generated, the SMSs will be processed through PASS Mission Scheduler and Command Loader. Output files will be input into MEGG to generate a timeline with the new instrument information. Output products from all systems will be carefully reviewed to ensure that no errors exist in processing. **A SMS will be made available for uplink to the VEST.** Refer to Figure A-1 for an illustration of the basic system configuration.

The second session, Realtime Telemetry Flow, will utilize the VEST, SOC, PRS, PASS, ESS, AEDP, **OPUS** and the PACOR II systems. This session will be used to validate **SSR, NSSC-1 flight software**, and STIS/NICMOS PDB updates with the ground system. **The VEST** will be configured to accept commanding and transmit simulated science and engineering telemetry for the new instruments **using STIS AND NICMOS BRZs**. Output products from all systems will be analyzed for erroneous conditions. Refer to Figure A-4 for an illustration of the basic system configuration.

A.2.2.4 Roles and Responsibilities

This Section identifies the SMGT-22 **Part 2** support roles and responsibilities for SR-3 Verification. (See Table A-2)

Table A-2. SMGT-22

SUPPORT AREA	SYSTEM/RESOURCES	ORGANIZATION
STOCC	PRS PASS, AEDP ESS TALOS PDB	LORAL/LMTO CSC/ATSC LORAL/LMTO/ATSC LMTO GSFC CODE 441
DOC	AP/TTAC/COMM	ATSC
ST ScI	SPSS/PASS/OPUS/HDA	ST ScI
SDPF	PACOR II	ATSC
SOC	SOC SIMULATOR	ATSC
VEST	STIS AND NICMOS BRZ SIMULATORs	GSFC CODE 442
ITAV	N/A	CTA
SVG	N/A	MOSES
O&GS SMSE	N/A	GSFC CODE 441
SYSTEMS ENGINEERING	N/A	MOSES
IDT	N/A	GSFC CODE 442

A.2.2.5 System/Facility Requirements

This section identifies the interfaces and functionality required from each of the systems and/or facilities involved in SMGT-22 **Part 2**.

A.2.2.5.1 PORTS Refurbishment System. The PRS system, Release 10.0, will be required to support test activities in Session 2. PRS will be configured to support command generation and telemetry receipt. PRS will be required to support the following interface connections for SMGT-22 Part 2: NASCOM (for connection to SOC and VEST), PASS, and ESS. PRS will interface with NASCOM for the receipt of engineering telemetry and the transfer of realtime commands and OBC loads. PRS will interface with PASS for the transfer of

engineering telemetry and the receipt of OBC loads. PRS will interface with ESS for the transfer of engineering telemetry and any SSR dumps. Schedules and loads. PASS will then interface with PRS for the transfer of these OBC loads. During Test Session 2, PASS will interface with PRS for the receipt of engineering telemetry and AEDP for the transfer of telemetry subsets.

A.2.2.5.2 POCC Application Software Support. The PASS system, Release 28, will be required to support test activities during all test sessions. PASS will support the following interface connections for SMGT-22 **Part 2: SPSS**, PRS, and AEDP. During Test Session 1, PASS will process the SMSs from the Institute and produce Mission

A.2.2.5.3 Astrometry and Engineering Data Processor. The AEDP system, Release 24, will be required to support test activities during Test Session 2. AEDP will support the following interface connections for SMGT-22 **Part 2: PASS**, ESS, and **OPUS**. AEDP will inter-face with PASS for the receipt of telemetry captured during Test Session 2. AEDP will interface with ESS and **OPUS** for the transfer of AEDP magnetic tape products.

A.2.2.5.4 Engineering Support System. The ESS system, Release 3.8, will be required to support test activities during Test Session 2. ESS will support the following interface connections for SMGT-22 **Part 2: PRS** and AEDP. ESS will interface with PRS for the receipt of realtime engineering telemetry and history tapes. ESS will interface with AEDP for the receipt of Astrometry and engineering data tapes.

A.2.2.5.5 Telemetry Analysis and Logic for Operations Support. The most current release of the TALOS system will be required to support test activities during Test Session 2. TALOS will support the interface connection to ESS. TALOS will interface with ESS for the receipt of HST engineering telemetry in the form of EDBs.

A.2.2.5.6 Project Data Base. The PDB, Release SMDB23, will be used during interface, regression testing, and all SMGT-22 test sessions. A portion of the PDB files will be validated by MOSES SVG personnel and IDTs prior to test execution.

A.2.2.5.7 Packet Processor II. The PACOR II, Release 3.0, will be required to support test activities during Test Session 2. PACOR II will support the following interface connections: NASCOM and **OPUS**. The PACOR II will interface with NASCOM for the receipt of science telemetry from the **STIS AND NICMOS BRZ located in the VEST**. Once the science data has been processed, the PACOR II will interface with **OPUS** for the transfer of science data subsets.

A.2.2.5.8 Science Telescope Science Institute. The **ST ScI** will be required to support the following interface connections for SMGT-23 Part 1: PASS, AEDP, and PACOR II. The **SPSS** will interface with PASS for the transmission of a **Science Mission Specification (SMS)** and receipt of PASS products. The **OPUS** will interface with AEDP for the receipt of engineering data. The **OPUS** will interface with the PACOR II for the receipt of science data subsets. The ST ScI will support these interfaces: **SPSS** and **OPUS**.

A.2.2.5.9 HST Simulator. The HST Simulator will be required to support test dry run activities during Test Session 2. During the dry run, the simulator is expected to interface with the SOC and PRS. The HST Simulator will provide these interfaces for the transfer of simulated spacecraft engineering telemetry and the receipt of realtime commands. The HST Simulator will accept command data at 1000 bps in the TDRSS block format and transmit 32 Kbps format TN/**HN** engineering telemetry also in the TDRSS block format. Telemetry from the simulator will be transmitted to the SOC, reformatted into JSC blocks, and then transferred to the HST MOC for capture and processing. Similarly, commands generated at the PRS system will be reformatted by the SOC into TDRSS format and sent to the HST Simulator.

A.2.2.5.10 Simulation Operations Center. The SOC will be required to support activities during Test Session 2. The SOC will be required to interface with the HST Simulator, PACOR II and the HST MOC. The SOC will provide these interfaces for the receipt of simulated spacecraft engineering telemetry from the **VEST**, receipt of JSC commands from the HST MOC and the transfer of reformatted HST commands and JSC telemetry. The SOC will also receive JSC commands from the HST MOC which will be reformatted into TDRSS blocks and then routed to the **VEST**. **The Portable Spacecraft Simulator (PSS) may be used to transmit canned science data, prerecorded by STIS AND NICMOS BRZ, for the STIS and NICMOS instruments which will be captured by PACOR II.**

A.2.2.5.11 BESST Release Zero. The BESST Release Zero (BRZ), located at the VEST facility in Building 29, will be

required to support activities during Test Session 2. The **STIS AND NICMOS BRZs** will be required to interface with the VEST structure (including DF224/COP and NSSC-1 computers), and with NASCOM for connection with the HST MOC PRS system. The **STIS AND NICMOS BRZs** will provide these interfaces for the receipt of STIS and NICMOS command loads and transmission of memory dumps to the PRS system and science data to PACOR II.

A.2.2.6 Duration

Test Session 1 - 40 hours

Test Session 2 - 12 hours

A.2.2.7 Dependencies

The dependencies for this test include:

- SMDB with updates from IDTs
- All SR-3 SM upgrades to ground system have been completed
- VEST **STIS AND NICMOS BRZ**
- SOC upgrade for new SIs

A.2.2.8 Test Schedules

These are the planned dates for SMGT-22 **Part 2** activities, based on the most recent version of the O&GS Project Schedule.

- | | |
|-------------------------------|---------|
| - Test Plan/Procedure (Draft) | 7/1/96 |
| - Test Plan/Procedure (Final) | 7/18/96 |
| | |
| - Session 1 | 7/15/96 |

- Session 2 Dry Run 7/23/96
- Session 2 Test 7/31/96
- Session 2 Contingency 8/7/96
- Test Report 8/30/96

A.3 SMGT-23 (Part 1)/SR #4 VERIFICATION

This Section provides detail information on the SMGT-23 (Part 1) Test for SR-4 Verification.

A.3.1 Purpose

SMGT-23 is divided into two separate parts: Part 1 and Part 2. Part 1 is a string test designed to verify the fourth phase of ground system readiness and support for the Second Servicing Mission. Part 2 is an End-to-End Command Plan Test which is discussed in Appendix C.

A.3.2 Objectives

- a. To exercise the STIS and NICMOS Phase 3 commanding capabilities including ST ScI proposal processing and SMS generation, PASS processing, and product review.
- b. To exercise the final versions of ground and flight software.
- c. To verify STIS and NICMOS final pipeline calibration capabilities.
- d. To perform standard regression test activities against the new releases of system software.

- e. To verify the NSSC-1 interface with the new SIs for both commanding and telemetry.

A.3.3 Activities

SMGT-23 Part 1 will consist of two test sessions. Each test session is created to ensure that all test objectives and requirements covered by this SMGT are verified. A brief description of these two test sessions is covered in following paragraphs.

The first session, Command Generation and Processing, will involve **SPSS**, PASS, and MEGG. This test session will verify the ability of **SPSS** to produce several SMSs containing STIS and NICMOS Phase 3 commands. Once generated, the SMSs will be processed through PASS Mission Scheduler and Command Loader. Output files will be input into MEGG to generate a timeline with the new instrument information. Output products from all systems will be carefully reviewed to ensure that no errors exist in processing. Refer to Figure A-1 for an illustration of the basic system configuration.

The second session, Realtime Telemetry Flow, will utilize the HST Simulator, SOC, SPIF, PRS, PASS, ESS, AEDP, **OPUS**, and PACOR II systems. This session will be used to validate the final flight versions of system software and launch configuration of the ground system prior to the mission. The HST Simulator will be configured to accept commanding and transmit simulated science and engineering telemetry for the new instruments. A portion of the test will involve transitioning between TDRSS and JSC modes, which is a necessary configuration during future SIMs, JISs, and the mission. Output products from all systems will be analyzed

for erroneous conditions. Refer to Figures A-2 and A-3 for an illustration of the basic system configuration.

A.3.4 Roles and Responsibilities

This Section identifies the SMGT-23 (Part 1) support roles and responsibilities for SR-4 Verification. (See Table A-3).

Table A-3. SMGT 23

SUPPORT AREA	SYSTEM/RESOURCES	ORGANIZATION
STOCC	PRS	LORAL/LMTO
	PASS	ATSC
	ESS	LORAL/LMTO/ATSC
	HST SIM	LMTO/ATSC
DOC	AP/TTAC/COMM	ATSC
ST ScI	SPSS/PASS/OPUS/HDA	ST ScI
SDPF	PACOR II	ATSC
MSOCC	SPIF	ATSC
SOC	SOC SIMULATOR	ATSC
VEST	BRZ SIMULATOR	GSFC CODE 442
ITAV	N/A	CTA
SVG	N/A	MOSES
O&GS SMSE	N/A	GSFC CODE 441
SYSTEMS ENGINEERING	N/A	MOSES
IDT	N/A	GSFC CODE 442

A.3.5 System/Facility Requirements

This section identifies the interfaces and functionality required from each of the systems and/or facilities involved in SMGT-23.

A.3.5.1 PORTS Refurbishment System. The PRS system, Release 11.0, will be required to support test activities in Session 2. PRS will be configured to support command generation and telemetry receipt. PRS will be required to

support the following interface connections for SMGT-23: NASCOM (for connection to SOC and HST Sim), PASS, and ESS. PRS will interface with NASCOM for the receipt of engineering telemetry and the transfer of realtime commands and OBC loads. PRS will interface with PASS for the transfer of engineering telemetry and the receipt of OBC loads. PRS will interface with ESS for the transfer of engineering telemetry.

A.3.5.2 POCC Application Software Support. The PASS system, Release 30, will be required to support test activities during all test sessions. PASS will support the following interface connections for SMGT-23: **SPSS**, PRS, and AEDP. During Test Session 1, PASS will process the SMSs from the Institute and produce Mission Schedules and loads. PASS will then interface with PRS for the transfer of these OBC loads. During Test Session 2, PASS will interface with PRS for the receipt of engineering telemetry and AEDP for the transfer of telemetry subsets.

A.3.5.3 Astrometry and Engineering Data Processor. The AEDP system, Release 25, will be required to support test activities during Test Session 2. AEDP will support the following interface connections for SMGT-23: PASS, ESS, and **OPUS**. AEDP will inter-face with PASS for the receipt of telemetry captured during

Test Session 2. AEDP will interface with ESS and **OPUS** for the transfer of AEDP magnetic tape products.

A.3.5.4 Engineering Support System. The ESS system, Release 3.8, will be required to support test activities during Test Session 2. ESS will support the following interface connections for SMGT-23: PRS and AEDP. ESS will

interface with PRS for the receipt of realtime engineering telemetry and history tapes. ESS will interface with AEDP for the receipt of Astrometry and engineering data tapes.

A.3.5.5 Telemetry Analysis and Logic for Operations Support.

The most current release of the TALOS system will be used to support test activities during Test Session 2. TALOS will support the following interface connections for SMGT-23: SPIF and ESS. TALOS will interface with SPIF for the receipt of PPF and CAS data. TALOS will interface with ESS for the receipt of HST engineering telemetry in the form of EDBs.

A.3.5.6 Thermal Monitoring System. The most current release of the TMS system will be used to support test activities during Test Session 2. TMS will interface with the SPIF facility during SMGT-23. TMS will interface with SPIF for the receipt of PPF and CAS data.

A.3.5.7 Project Data Base. The PDB, Release SMDB24, will be used during interface, regression testing, and both SMGT-23 test sessions. A portion of the PDB files will be validated by MOSES SVG personnel and IDTs prior to test execution.

A.3.5.8 Packet Processor II. The PACOR II, Release 4.0, will be required to support test activities during Test Session 2. PACOR II will support the following interface connections: NASCOM and **OPUS**. The PACOR II will interface with NASCOM for the receipt of canned science telemetry from the HST Simulator. Once the science data has been processed,

the PACOR II will interface with **OPUS** for the transfer of science data subsets.

A.3.5.9 **Science Telescope Science Institute.** The **ST ScI** will be required to support the following interface connections for SMGT-22 Part 1: PASS, AEDP, and PACOR II. The **SPSS** will interface with PASS for the transmission of a **Science Mission Specification (SMS)** and receipt of PASS products. The **OPUS** will interface with AEDP for the receipt of engineering data. The **OPUS** will interface with the PACOR II for the receipt of science data subsets. The ST ScI will support these interfaces: **SPSS** and **OPUS**.

A.3.5.10 Shuttle POCC Interface Facility. The SPIF will be required to support test activities during Test Session 2. The SPIF will be required to provide the following interface connections: SOC and ESS. The SPIF will interface with the SOC for the receipt and processing of JSC telemetry containing PPF and CAS data. The SPIF will interface with TMS and TALOS for the transfer of shuttle data.

A.3.5.11 HST Simulator. The HST Simulator will be required to support test activities during Test Session 2. During this test session, the simulator is expected to interface with the SOC and PRS. The HST Simulator will provide these interfaces for the transfer of simulated spacecraft engineering telemetry and the receipt of realtime commands. The HST Simulator will accept command data at both 125 bps and 1000 bps in the TDRSS block format and transmit 32 Kbps format TN engineering telemetry also in the TDRSS block format. Telemetry from the simulator will be transmitted to the SOC, reformatted into JSC blocks, and then transferred to

the HST MOC for capture and processing. Similarly, commands generated at the PRS system will be reformatted by the SOC into TDRSS format and sent to the HST Simulator. The HST Simulator will also transmit canned science data for the STIS and NICMOS instruments which will be captured by PACOR II.

A.3.5.12 Simulation Operations Center. The SOC will be required to support activities during Test Session 2. The SOC will be required to interface with the HST Simulator and the HST MOC. The SOC will provide these interfaces for the receipt of simulated spacecraft engineering telemetry from the HST Simulator, receipt of JSC commands from the HST MOC and the transfer of reformatted HST commands and JSC telemetry. The SOC will also receive JSC commands from the HST MOC which will be reformatted into TDRSS blocks and then routed to the HST Simulator.

A.3.5.13 BESST Release Zero. The BRZs will be required to support activities during Test Session 2. The BRZs will be required to interface with the VEST structure (including DF224/COP and NSSC-1 computers), and with NASCOM for connection with the HST MOC PRS system. The BRZs will provide these interfaces for the receipt of STIS and NICMOS command loads and transmission of memory dumps to the PRS system.

A.3.6 Duration

Test Session 1 - 40 hours

Test Session 2 - 12 hours

A.3.7 Dependencies

The dependencies for this test include:

- All SR-4 SM ground system upgrades have been completed
- VEST BRZs
- SOC upgrades for new SIs

A.3.8 Schedules

These are the planned dates for SMGT-23 activities, based on the most recent version of the O&GS Project Schedule.

- | | |
|-------------------------------|----------|
| - Test Plan/Procedure (Draft) | 11/25/96 |
| - Test Plan/Procedure (Final) | 12/13/96 |
| | |
| - Session 1 | 12/5/96 |
| - Session 2 Dry Run | 12/9/96 |
| - Session 2 Test | 12/23/96 |
| - Session 2 Contingency | 12/30/96 |
| | |
| - Test Report | 1/23/97 |

A.4 SMGT-28/SMOV

This Section provides detail information on the SMGT-28 Test for SMOV Verification.

A.4.1 Purpose

SMGT-28 is a ground system test which is designed to verify the commanding capabilities at the ST ScI and GSFC for

supporting the new instruments once they have been installed onto the spacecraft.

A.4.2 Objectives

- a. To exercise ST ScI proposal processing and SMS generation capabilities for STIS and NICMOS SMOV activities.
- b. To exercise PASS SMS processing capabilities for STIS and NICMOS SMOV activities.

A.4.3 Activities

SMGT-28 will demonstrate the ST ScI's ability to correctly implement SMOV observing proposals and will serve as an interface test between the PASS system located at GSFC and the various ST ScI systems located at Johns Hopkins University in Baltimore. The test will involve the development, submittal, and processing of proposals at the ST ScI into SMSs. Selected SMSs will then be processed through the PASS system. PASS output products will be then be analyzed by the IDTs, Science Teams, and the ST ScI. Refer to Figure A-5 for an illustrated overview of the basic test flow.

PASS Operations (PASSOPS) will be responsible for tracking all SMS deliveries and also for ensuring that output products are routed to the proper personnel in a timely fashion. It is expected that standard operating procedures will be followed by the ST ScI and PASSOPS for the transfer of all products.

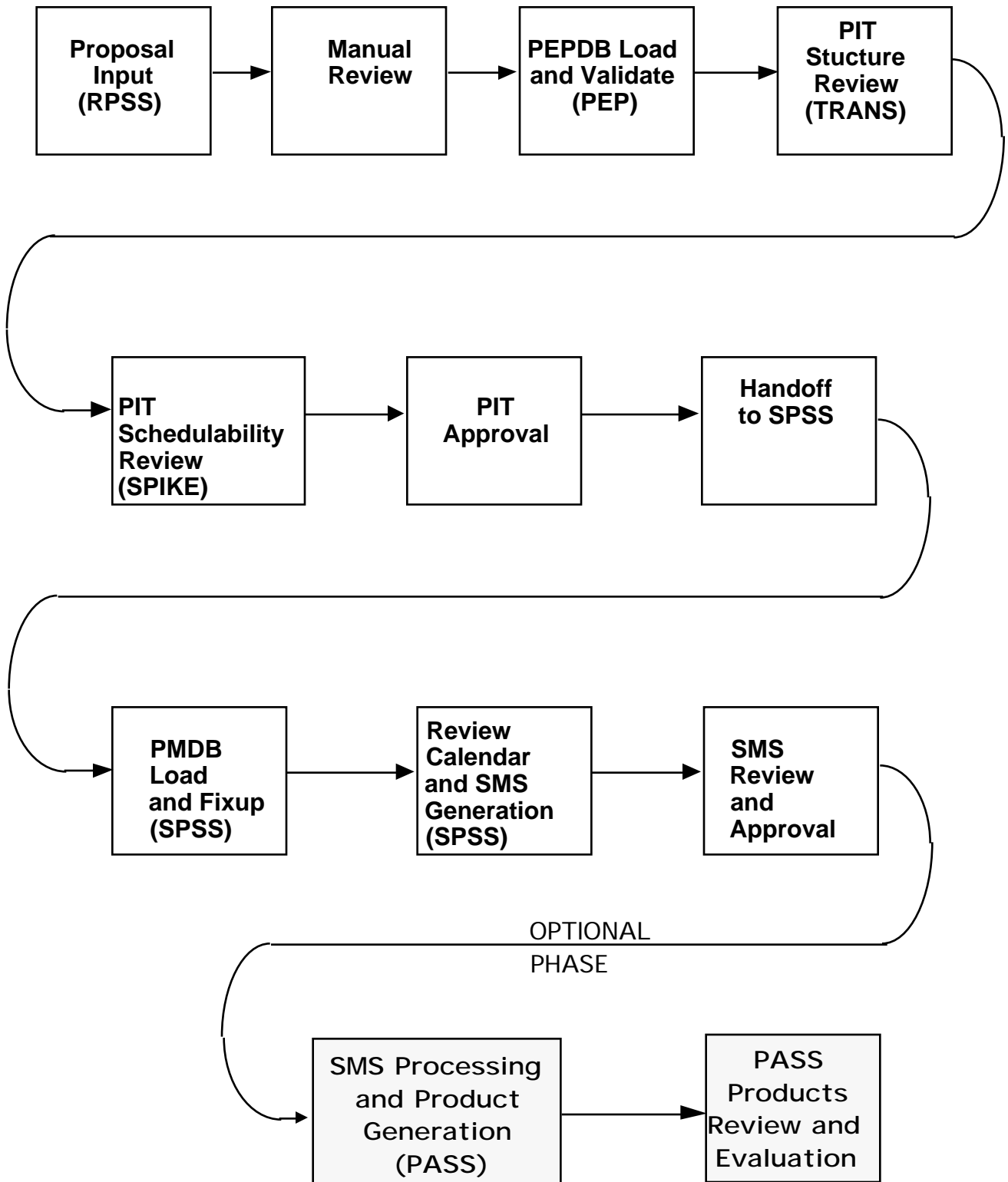


Figure A-5. SMOV Test Flow

PASSOPS will provide the systems and personnel necessary to exercise the PASS system during testing. PASSOPS personnel will provide analysis of the input products, operation of the system during processing activities, and analysis of output products. The input products will include, but are not limited to, ST ScI SMSs and Flight Dynamics Facility (FDF) ephemerides.

Output products will include standard Mission Scheduler and Command Loader reports and files. The output products will be provided to the ST ScI for Institute evaluation. It is expected that PASSOPS will provide a turnaround time of one week for generation of output products. The results of all PASSOPS SMS processing and analysis will be provided to the Test Coordinator, in a written format, for inclusion into the final test report.

The ST ScI will evaluate the Mission Schedule and Command Loader PASS products from each of the processed test SMSs. The results of all evaluations will be provided to the Test Coordinator. The ST ScI will have a 4 week period during which evaluation and approval of SMS output products will be conducted. At the conclusion of the review period, the ST ScI will issue a Review SMS report, which will be electronically transmitted to the Test Coordinator for tracking purposes and inclusion in the test report.

A.4.4 Roles and Responsibilities

This Section identifies the SMGT-28 support roles and responsibilities for SMOV Verification. (See Table A-4).

Table A-4. SMGT-28

SUPPORT AREA	SYSTEM/RESOURCES	ORGANIZATION
STOCC	PASS	CSC/ATSC
DOC	COMM	ATSC
PASSOPS	N/A	ATSC
ST Sci	SPSS/PASS/OPUS/HDA	ST Sci
ITAV	N/A	CTA
SVG	N/A	MOSES
O&GS SMSE	N/A	GSFC CODE 441
SYSTEMS ENGINEERING	N/A	MOSES
IDT/SI TEAMS	N/A	BALL/LMTO/ GSFC CODE 442

A.4.5 System/Facility Requirements

This section identifies the interfaces and functionality required from each of the systems and/or facilities involved in SMGT-28.

A.4.5.1 POCC Application Software Support. The PASS system, Release 30, will be required to support test activities during all test sessions. PASS will interface with the ST Sci during SMGT-28. PASS will process the SMSs from the Institute and produce Mission Schedules and command loads. PASSOPS will use the PASS test system for processing of all SMSs to avoid the possibility of confusing a test SMS and/or output products with those required for daily spacecraft operations. SMS receipt from the ST Sci and PASS output product delivery to the ST Sci may occur electronically or via tape.

A.4.5.2 Science Telescope Science Institute. The ST Sci will generate proposals and SMSs to support SMGT-28 testing.

The ST ScI will be required to interface with PASSOPS for the transfer of SMSs and receipt of PASS products. During the test phase, the ST ScI will provide the following systems for the generation and processing of proposal and SMS information:

- Proposal Entry Processor (PEP)
- Transformation Subsystem (TRANS)
- Science Planning and Scheduling System (**SPSS**)
- Instruction Manager (IM)
- Remote Proposal Submission System (RPSS)

A.4.6 Duration

This test will be conducted over an 8 month period with proposals being generated every week between April 96 and December 96.

A.4.7 Dependencies

Dependencies for this test include:

- **SPSS** Phases 1, 2, and 3 are completed on schedule
- SMOV proposals

A.4.8 Schedules

These are the planned dates for SMGT-28 activities, based on the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft) 3/1/96
- Test Plan/Procedure (Final) 3/22/96
- SMOV SMS Processing 4/96 - 12/96

- Test Report

12/31/96